

$$\Psi_s = -iCRT$$

Name: \_\_\_\_\_

# AP Water Potential Sample Questions

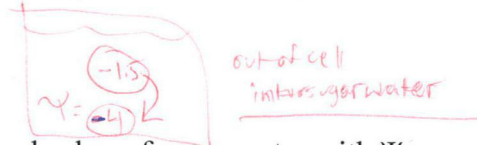
$$\begin{matrix} \uparrow +0 \\ \Psi \\ \downarrow \Psi \end{matrix}$$

$$\Psi = \Psi_s + \Psi_p$$

1. If a cell's  $\Psi_p = 3$  bars and its  $\Psi_s = -4.5$  bars, what is the resulting  $\Psi$ ?

$$3 + (-4.5) = -1.5$$

2. The cell from question #1 is placed in a beaker of sugar water with  $\Psi_s = -4.0$  bars. In which direction will the net flow of water be?



3. The original cell from question #1 is placed in a beaker of sugar water with  $\Psi_s = -0.15$  MPa (megapascals). We know that 1 MPa = 10 bars. In which direction will the net flow of water be?

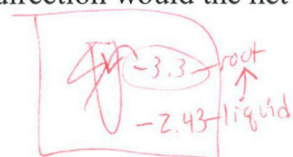
$$\begin{matrix} 1 \text{ MPa} & 0.15 \text{ MPa} \\ 10 \text{ bars} & ? \text{ bars} \end{matrix}$$

$$1 \times = 1.5$$

$$-1.5 \text{ bars}$$



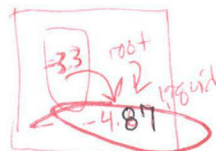
4. The value for  $\Psi$  in root tissue was found to be -3.3 bars. If you take the root tissue and place it in a 0.1 M solution of sucrose at 20°C in an open beaker, what is the  $\Psi$  of the solution, and in which direction would the net flow of water be?



$$(-1)(0.1 \text{ M})(0.0831)(293)$$

$$-2.43$$

NaCl dissociates into 2 particles in water:  $\text{Na}^+$  and  $\text{Cl}^-$ . If the solution in question 4 contained 0.1M NaCl instead of 0.1M sucrose, what is the  $\Psi$  of the solution, and in which direction would the net flow of water be?



$$(-2)(0.1 \text{ M})(0.0831)(293)$$

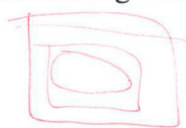
$$-4.87$$

5. A plant cell with a  $\Psi_s$  of -7.5 bars keeps a constant volume when immersed in an open-beaker solution that has a  $\Psi_s$  of -4 bars. What is the cell's  $\Psi_p$ ?



$$\Psi = \Psi_s + \Psi_p$$

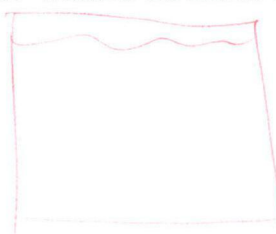
6. At 20°C, a cell containing 0.6M glucose is in equilibrium with its surrounding solution containing 0.5M glucose in an open container. What is the cell's  $\Psi_p$ ?



$$\begin{matrix} \text{cell} \\ \Psi_s = (-1)(0.6)(0.0831)(293) = -14.6 \\ \text{solution} \\ \Psi_s = (-1)(0.5)(0.0831)(293) = -12.2 \end{matrix}$$

$$\Psi_p = 2.4$$

7. At 20°C, a cell with  $\Psi_p$  of 3 bars is in equilibrium with the surrounding 0.4M solution of sucrose in an open beaker. What is the molar concentration of sucrose in the cell?



$$\Psi_p = 3$$

$$\Psi = \Psi_p + \Psi_s$$

$$(-1)(C)(0.0831)(293)$$

$$\begin{aligned} -9.7 &= 3 + (-24.3)(C) \\ -12.7 &= (-24.3)(C) \\ -24.3 C & \end{aligned}$$

$$0.52$$

$$(-1)(0.4)(0.0831)(293)$$

$$-9.7$$